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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/336,401	06/18/1999	JULIA S. SVIRCHEVSKI	LAM1P109	7588

25920 7590 08/19/2002

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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 08/19/2002

19

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/336,401

Applicant(s)

SVIRCHEVSKI ET AL

Examiner

Lynette T. Umez-Eronini

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 2-11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 2, line 3, " the operation of wetting" lacks antecedent basis.

In claim 3, line 3, " the operation of wetting" lacks antecedent basis.

In claim 4, line 3, "the wetting and the scrubbing operations" lacks antecedent basis.

In claim 5, line 3, "the wetting operation" lacks antecedent basis.

In claim 5, lines 3-4, "the scrubbing operation" lacks antecedent basis.

In claim 6, line 2, " the operation of wetting" lacks antecedent basis.

In claim 7, line 2, "the operation of wetting" lacks antecedent basis.

In claim 8, lines 2-3, "the operation of wetting" lacks antecedent basis.

In claim 9, line 4, "the wetting operation" lacks antecedent basis.

In claim 10, line 2, "the wetting operation" lacks antecedent basis.

In claim 11, lines 2 and 4-5, "the wetting operation" lacks antecedent basis.

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Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this

Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

4. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Bersin et al. (US 5,882,489).

Bersin teaches a method of cleaning a surface of a semiconductor wafer following a plasma etching operation. The method comprises rinsing the wafer in DI water, optionally with ultrasonic agitation (column 4, lines 22-27), which is the same as using a non-splash rinse technique wherein the non-splash rinse technique being configured to quickly and evenly saturate the surface of the semiconductor wafer.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2-5 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bersin ('489), as applied to claim 1 above, and further in view of Gockel et al. (US 5,809,832).

Bersin differs in failing to teach scrubbing the surface of the wafer with a cleaning brush that applies a chemical solution to the surface of the wafer after wetting the wafer surface, **in claim 3**; performing the wetting and scrubbing in a brush box, **in claim 4**; setting a first delivery and a second delivery source over the surface of the wafer in order to wet the surface of the wafer with a flow rate of water, **in claim 6**.

Gockel teaches scrubbing the surface of a wafer with a cleaning brush that applies a chemical solution to the surface of the wafer after the wetting (column 8, lines 14-17); performing the wetting and scrubbing in a brush box (column 1, lines 28-41) that contains two brushes **511** and **512** (column 7, lines 49-52 and Figure **5**; column 15, lines 16-18; and Figure **14**); incorporating spray heads **505** and **506** to spray cleaning solutions on the wafer (column 7, lines 50-53; column 15, lines 16-19; and Figure **5**) reads on setting a first delivery and a second delivery source over the surface of the wafer in order to wet the surface

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of the wafer with a flow rate of water; and rotating the wafer (column 1, lines 18-20).

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Bersin by using the scrubbing method as taught by Gockel for the purpose of removing wafer contaminants that may cause device failure.

7. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bersin (US ' 678) as applied to claim 1 above.

Bersin differs in failing to teach setting flow rate between 50 ml/minute and 500 ml/minute; setting a time of less than 4 seconds to wet substantially all of a top surface of the wafer; and rotating the wafer about a radial axis at a rate of between 2 and 20 rpm, respectively, **in claims 6-8**.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to employ any of a variety of operational variables such as those claimed by the applicant. They are well-known variables in the art of cleaning semiconductor wafers and known to affect both the rate and quality of the cleaning process. Conducting routine experimentation to obtain a clean wafer surface would optimize the selection of a particular value. Changes in temperature, concentrations, or other process conditions of an old process do not impart patentability unless the recited ranges are critical, i.e. they produce a new and unexpected result. *In re Aller et al.*, 105 USPQ 233.

7. Claims 21-24 rejected under 35 U.S.C. 103(a) as being unpatentable over Lo et al. (US 5,804, 091) and further in view of Gabriel (US 5,730,834).

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Lo teaches a method of cleaning a surface of a semiconductor wafer following a plasma etching operation. The method comprises: water flushing with megasonic shaking, which is the same as wetting the surface of the semiconductor wafer by using a non-splash rinse technique, the non-splash rinse technique being configured to quickly and evenly saturate the surface of the semiconductor wafer (Abstract; column 1, lines 39-52; column 2, lines 3-34; column 7, lines 50-53 and Figure 5). Dumping a wafer in a tank containing cleaning solution, in which megasonic energy has been applied, performs megasonic shaking.

Lo differs in failing to teach setting at least one delivery source over the surface of the of the wafer in order to saturate the surface of wafer; the surface of the wafer being quickly saturated in less than 4 seconds while minimizing splashing over the surface of the wafer; setting the outlet of at least one delivery source to at least partially over an edge of the wafer and at an angle relative to the surface of the wafer to range between 5 and 35 degrees, **in claim 24**; setting the outlet end of the delivery source to overlie an edge of the semiconductor wafer by a distance of 2 to 30 mm, **in claim 22** and by a flow rate of 50 to 300 ml/min, **in claim 23**.

Gockel teaches wetting the surface of the semiconductor wafer by setting at least one delivery source over the surface of the wafer in order to evenly saturate the surface of the wafer (column 7, lines 50-52) and interacting with the control board which controls motors or other devices within the scrubber control system (column 15, line 38 – column 16, line 17), which reads on adjusting

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parameters such as the wetting contact time and the angle of the delivery source relative to the wafer surface.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Lo by using the method of controlling the process parameters such as the delivery flow rate, wetting time, and rotational speed of the wafer as taught by Gockel for the purpose of obtaining a contaminated free substrate.

8. Claims 25-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gockel.

Gockel teaches a method for cleaning the surface of semiconductor wafers. The method comprises: loading and moving dirty wafers from load station to from load station to scrubber (column 14, lines 60-64 and Figure **14**), which is the same as receiving a semiconductor wafer; incorporating spray heads **505 and 506** that are mounted at the entrance and exit of brush boxes **105 and 106** to spray cleaning solution onto wafers (column 7, lines 51-53 and Figure **5**) reads on positioning an outlet end of at least one liquid delivery source relative to a surface of the semiconductor wafer so that the outlet end overlies an edge of the semiconductor wafer and applying liquid to the surface of the semiconductor wafer through the outlet end of the at least one liquid delivery source. Gockel further teaches interacting with the control board which controls motors or other devices within the scrubber control system (column 15, line 38 – column 16, line 17), which position an outlet end of at least one liquid delivery source relative to a

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surface of the semiconductor wafer so that the outlet end overlies an edge of the semiconductor wafer

Gockel differs in failing to specify processing variables such as a distance from about 2 mm to about 30 mm from where and an angle in a range from 5-35 degrees relative to the outlet end of the liquid delivery source overlies the semiconductor; the distance of 2 to 15 mm from where the outlet end is disposed above the surface of the semiconductor wafer, **in claims 25, 29, 30 and 31**; flow rate between 50 ml/minute and 300 ml/minute through the outlet end of the liquid delivery source, **in claim 27**; setting a time of less than 4 seconds to wet substantially all of a top surface of the wafer; rotating the wafer about a radial axis at a rate of between 2 and 20 rpm, **in claim 28**.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to employ any of a variety of operational variables such as those claimed by the applicant. They are well-known variables in the art of cleaning semiconductor wafers and known to affect both the rate and quality of the cleaning process. Conducting routine experimentation to obtain a clean wafer surface would optimize the selection of a particular value. Changes in temperature, concentrations, or other process conditions of an old process do not impart patentability unless the recited ranges are critical, i.e. they produce a new and unexpected result. *In re Aller et al.*, 105 USPQ 233.

Response to Arguments

9. Applicant's arguments filed May 20, 2002 have been fully considered but they are not persuasive. Applicant argues that Bersin fails to teach rinsing is performed under no-splash rinse conditions, in claim 1. Applicant argument is unpersuasive because Bersin teaches rinsing is optionally done by ultrasonic agitation, which is known in the art as stirring or flowing a liquid by applying sound waves (resonance frequency).

Applicant argue the combination of Bersin in view of Gockel in the rejection of claims 2-11 because Gockel fails to teach or suggest wetting the surface of a wafer by using a non-splash rinse technique, which fails to cure the deficiency of Bersin. Applicant's argument is unpersuasive because Gockel is relied upon to teach scrubbing the surface of a wafer with a cleaning brush that applies a chemical solution to the surface of the wafer after the wetting (column 8, lines 14-17); performing the wetting and scrubbing in a brush box (column 1, lines 28-41) that contains two brushes **511** and **512** (column 7, lines 49-52 and Figure **5**; column 15, lines 16-18; and Figure **14**); incorporating spray heads **505** and **506** to spray cleaning solutions on the wafer (column 7, lines 50-53; column 15, lines 16-19; and Figure **5**) reads on setting a first delivery and a second delivery source over the surface of the wafer in order to wet the surface of the wafer with a flow rate of water: and rotating the wafer (column 1, lines 18-20).

Applicant argues that Gockel fails to specify parameters as recited in claims 25-31 and requests the Examiner to support the allegation that the claimed parameters are "well-known variable in the art of cleaning semiconductor

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wafers and known to affect both the rate and quality of the cleaning process. To support the teaching of known process parameters that are well-known in the art, Elliot et al. (US 5,669,979) is relied upon to teach surface cleaning semiconductor substrate using a liquid that has a velocity between 0.2 mm/sec and 2,000 mm/sec (column 1, lines 11-25 and column 2, lines 9-12 and 28-30). It is noted that since this value is a velocity, then the units should read "0.2mm³/sec and 2000mm³/sec which is equivalent to 0.012 ml/min and 120ml/min (Note: 1ml = 1cm³; 1000mm³ = 1cm³; mm³/sec ~ (60 sec/min)(cm³/1000mm³)) and which lies within a range of a flow rate between 50 ml/minute and 300 ml/minute. The depth of substrate surface below the surface of the liquid may be less than 50 mm, and preferably less than 20 mm (column 2, lines 13-15), which lies within applicant's range from 2 mm to about 30 mm. The fluid may be a gas or liquid directed at an angle of less than 90 degrees to the surface, preferably between 0 and 20 degrees (column 2, lines 18-21 and 27-30), which falls within applicant's range from about 5 to 35 degrees. Tomoeda et al. (5,759,614) teaches supplying a rinse solution onto a wafer having a rotational speed of 1.5 to 2.0 rpm (column 8, lines 5-7), which falls in applicant's range of 2 to about 20 revolutions per minute.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tomoeda et al. (US 5,759,614) and Elliot et al. (US 5,669, 979) are relied upon to teach process parameters as claimed in the present invention.

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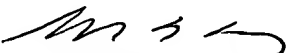
11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner can normally be reached on Second Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-972-9310 for regular communications and 703-972-9311 for After Final communications.

ltue
August 14, 2002


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